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Making and storing **FARM BUTTER** for home use

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BUTTER OF THE FINEST FLAVOR can be made only from cream that is fresh and clean in flavor.

The cream may be churned either when sweet or when sour.

Butter keeps best when made from sweet cream that has been pasteurized.

Temperature is an important factor in making good butter. Correct temperatures can be determined only by using an accurate thermometer.

Cream that is to be kept sweet should be cooled promptly to a temperature below 50° F.

Cream that is to be soured for churning should be kept between 70° and 75° F. until slightly sour and then cooled promptly to churning temperature or below.

Strong, cheesy, sour, or other off-flavors in freshly made butter may be caused by souring cream at too high a temperature or for too long a time. These bad flavors may be avoided by churning the cream while it is fresh and sweet or when it is only slightly sour.

The proper churning temperature is that which will cause the butter to form in granules that are firm but not hard, usually in 30 to 40 minutes of churning. This temperature may be as low as 54° F. in summer and as high as 64° in winter. It is necessary to hold the cream at or below the churning temperature for at least 2 hours before it is churned. Churning cream when it is too warm or immediately after it has been cooled produces soft, greasy butter.

The temperature of the water used in washing the butter should be such that the butter will have the right degree of firmness to be worked properly.

The best place to store butter is in a refrigerator or cold-storage locker where a constant low temperature can be maintained. When refrigeration is not available, butter made from pasteurized sweet cream can be stored successfully in brine.

This bulletin supersedes Farmers' Bulletin 876, Making Butter on the Farm, and Leaflet 9, Making and Storing Farm Butter for Winter Use.

MAKING AND STORING FARM BUTTER FOR HOME USE

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FARM-MADE BUTTER, as an article of commerce, has been supplanted very largely by creamery butter. On many farms, however, it is still desirable to make butter for home use. Butter may be made in the summer from surplus milk or cream and stored for use in the fall and winter. The purpose of this publication is to tell (1) how to make good farm butter for current use and (2) how to make good butter that will keep well in storage.

The flavor of butter is the main factor that determines how good it is, but, as in many other food products, the body, texture, color, and general appearance are also items that influence the consumer's opinion of its quality. The best butter has a fine flavor; a solid, waxy body; a uniform color—not mottled or streaked; the salt is entirely dissolved; the appearance is bright rather than dull or greasy-looking; the drops of moisture on a cut surface are small in size and are clear, not milky.

Making butter of good flavor is largely a matter of preventing bad flavors from getting into the milk and cream. Bad flavors in milk and cream may originate in several ways. They may come from certain feeds or weeds that the cow has eaten; they may be the result of allowing the milk or cream to absorb odors from the air in the barn, cellar,

or refrigerator; or they may be the result of the growth of micro-organisms that got into the milk or cream through the use of unclean methods or utensils and were able to grow and produce bad flavors because the milk or cream was held at too high a temperature or for too long a time. How to produce high-quality milk and cream is described in Farmers' Bulletin 602, *Production of Clean Milk*.

Making butter of good body, texture, and appearance is largely a matter of using the proper temperatures and methods in preparing the cream for churning and throughout the butter-making process.

BUTTER-MAKING EQUIPMENT AND ITS CARE

There are types and sizes of churns to meet any requirement. The wooden-barrel type of churn has been used for many years, especially in churning 2 or more gallons of cream at a time. The churn shown in figure 1 is made of glass and has wooden beaters. It comes in several

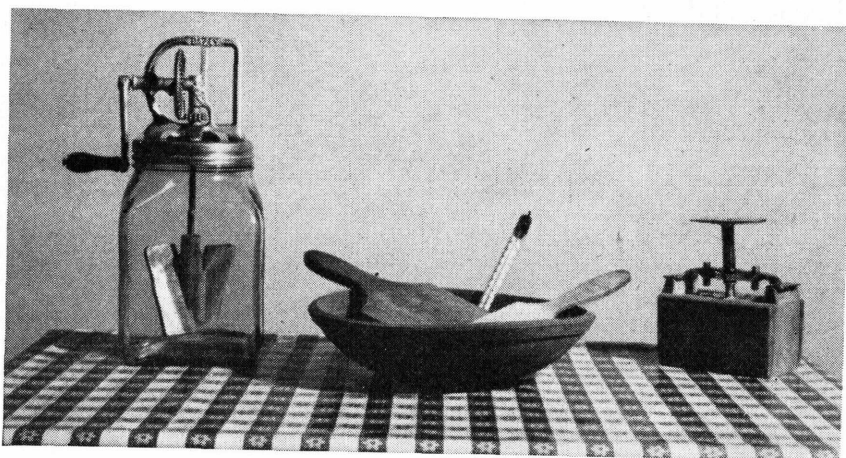


FIGURE 1.—Equipment for making small quantities of butter.

sizes. The old-style dasher churn is still widely used and produces very satisfactory results. An egg-beater or an electric mixer is a suitable device for churning as small a quantity of cream as 1 quart.

A butter worker is desirable when as much as 10 pounds of butter is made in a churning. Several styles of butter workers are manufactured. One style that is very simple and also very satisfactory is known as a "lever worker." Smaller quantities of butter can be worked readily, either in the churn or in a wooden bowl, by means of a wooden paddle.

Wooden paddles and ladles are made in a variety of shapes and sizes. When butter is made on a small scale and worked in the churn or in a bowl, a small flat paddle is most useful.

A thermometer is essential for making butter of uniform quality throughout the year. The most suitable kind is known as a floating dairy thermometer.

When butter is made on a moderately large scale, other utensils such as shotgun cans, a disk stirring rod, a strainer-dipper, and a butter

printer or mold for making molds or prints of butter, may be very useful.

For cleaning all equipment and utensils a brush is preferable to a cloth, and a dairy cleaning powder should be used rather than soap or soap powder.

All utensils used for milk and cream should be free from crevices, seams, and rusty places that make cleaning difficult. Unclean utensils harbor bacteria that may contaminate the milk or cream and cause the development of bad flavors, which are carried into the butter. If a cream separator is used, it should be taken apart every time it is used. The separator parts and other metal utensils should be cleaned, rinsed, and then treated to kill bacteria. Treatment with hot water is a common farm practice but it is effective only when the utensils become as



FIGURE 2.—Scald woodenware and then chill with cold water before using it.

hot as boiling water and stay hot for several minutes. Treatment with any one of the preparations that contain chlorine and are commonly sold for use in dairies is effective when used as recommended by the manufacturer.

Woodenware requires special treatment. Small utensils such as paddles, ladles, and printers should be soaked thoroughly in scalding water and then kept in cold water until they are to be used. This treatment greatly reduces the tendency of butter to stick to them. Larger equipment such as churns and butter workers should be rinsed with hot water and then thoroughly chilled with cold water. Immediately after use, they should be cleaned to prevent butter and buttermilk from soaking into the wood and producing an unsanitary condition. When wooden utensils are grease-soaked, butter will stick to them even though they are properly treated with hot and cold water before they are used.

CHURNING CREAM IS PREFERABLE TO CHURNING MILK

In some sections of the country farm butter is sometimes made by churning milk instead of cream. When a large quantity of butter-milk is wanted, the churning of milk may be justified. Otherwise, it is not a desirable practice because a large volume of milk must be churned to obtain a small quantity of butter, and the yield of butter is less than would be obtained by churning the cream. Also churning milk requires a high churning temperature, which is not conducive to the manufacture of the highest quality of butter.

SEPARATING THE CREAM

Cream may be separated from the milk by gravity or by a centrifugal separator. When the volume of milk is small the cream is usually separated by gravity—that is, the milk is placed in pans or straight-sided cans for 24 hours or more and the cream is then skimmed off. When this method is used, the milk should be cooled promptly to a temperature of 50° F. or lower and kept cold during the entire creaming period. When the milk is cold, the cream rises more quickly and more completely. Also, the low temperature greatly retards the multiplication of bacteria which unavoidably get into milk. Some bacteria produce acid and cause the souring of milk and cream. Others produce objectionable flavors which will injure the quality of the butter. The cream should be kept cold until it is prepared for churning.

The dilution of milk with water, in the belief that it aids creaming, has been practiced to a limited extent and a so-called “water separator” has been on the market for many years. This is merely a cylindrical vessel in which a mixture of milk and water is placed for gravity separation. It is provided with a faucet at the bottom and a glass “window” in the side, through which the cream line is visible. Investigations have shown, however, that the addition of water to milk causes less butterfat to be recovered in the cream. Furthermore, a watery flavor is imparted to the cream and to the butter, and the usefulness of the diluted skim milk is extremely limited.

ADVANTAGES OF USING A CREAM SEPARATOR

When the volume of milk is large enough to warrant the investment, a centrifugal separator should be used as it has the following advantages:

1. A centrifugal separator, properly operated, recovers more than 99 percent of the butterfat from the milk, whereas gravity separation as usually practiced recovers only about 85 percent, and, under adverse conditions, as little as 75 percent.
2. The cream can be obtained a few minutes after the milk has been drawn from the cow, and the relatively small volume of cream can be cooled quickly, thus preventing deterioration which is likely to occur during gravity separation.
3. Cream of the desired richness can be obtained readily by an adjustment of the separator bowl.
4. The skim milk is made available for use while fresh and sweet.

PROPER RICHNESS OF THE CREAM

For home butter making, the cream should be of such richness that 1 gallon will yield about 3 pounds of butter, that is, the butterfat content of the cream should be about 30 percent. Thick cream—more than 35 percent butterfat—may stick to the sides of the churn and cause difficult churning, especially if it is sour.

Cream produced for shipment to a creamery usually contains more than 30 percent butterfat. The exact percentage can be determined from the check received in payment for the cream. When such cream is used for home butter making, it should be diluted with skim milk. For example, cream of approximately 30 percent butterfat may be obtained by adding $\frac{1}{2}$ gallon of skim milk to 1 gallon of cream of 45 percent butterfat, or $\frac{1}{3}$ gallon of skim milk to 1 gallon of cream of 40 percent butterfat.

Thin cream—less than 20 percent butterfat—has the same objectionable features for churning that whole milk has, though to a lesser degree.

Cream separated by gravity is likely to contain less than 30 percent butterfat unless the skimming is done very carefully. The cream separator can be regulated to deliver cream of the proper richness.

BUTTER MAY BE MADE FROM EITHER SWEET OR SOUR CREAM

Ripening, or souring, cream preparatory to churning is a practice of long standing among farm butter makers. It originated centuries ago when farm conditions were so primitive that cream was usually sour by the time it was skimmed from the milk. For many years all creamery butter was made from sour cream, but within the last 30 years many creameries have changed to the churning of sweet cream. The popularity of sweet-cream creamery butter among consumers no doubt is one reason why some farm butter makers now churn their cream sweet and others seek information on making sweet-cream butter.

Many farm butter makers ask about the comparative churnability of sweet and sour cream. Under usual farm conditions the difference in churnability is very slight. The time required to churn sweet cream may be slightly longer than that required for sour cream when the sour cream is in the best possible condition for churning. If, however, the cream is overripe or very viscous a longer churning time may be required than for sweet cream. The amount of butterfat left in the buttermilk from sweet cream is likely to be slightly larger but the difference, less than $\frac{1}{2}$ of 1 percent, is very small when compared with the fat loss of as much as 4 percent which may be caused by insufficient cooling of the cream—either sweet or sour—before churning it.

TYPES OF BUTTER TO MAKE FOR CURRENT USE OR FOR STORAGE

There are three types of butter that may be made on the farm:

1. Sour-cream butter from raw cream.
2. Sweet-cream butter from raw cream.
3. Sweet-cream butter from pasteurized cream.

Butter of the highest quality may be made from either sweet or sour cream. Butter made from sour cream has a higher flavor and aroma than butter made from sweet cream, but it is likely to develop a strong, undesirable flavor sooner than the sweet-cream butter. Both types, if properly made, are usually satisfactory if the butter is to be used soon after it is made. When butter is to be kept for several weeks or months, however, the keeping quality is of paramount importance. Butter keeps best if it is made from sweet cream that has been pasteurized.

PREPARING THE CREAM FOR CHURNING

USE OF A DAIRY THERMOMETER IS ADVISABLE

In the preparation of cream for churning and in the entire butter making process, temperature is a factor of great importance. Disregard of temperature is one of the main causes of churning troubles on the farm. On the following pages definite temperatures are frequently specified. Accurate determinations of temperatures are possible only with the use of an accurate thermometer. The kind in common use for all dairy work is known as a floating dairy thermometer. A thermometer of this type can be obtained from any company that sells dairy supplies.

SOUR-CREAM BUTTER FROM RAW CREAM

When butter is to be made from raw sour cream, and enough for a churning is to be accumulated by saving small lots over a period of 2 or 3 days, each lot should be kept cold until it is to be ripened, or soured. The several lots should then be poured into one container, thoroughly mixed, and warmed to the ripening temperature (about 70° to 75° F.). When cream from the separator is to be ripened at once, it should be cooled promptly to the ripening temperature. In each case the cream should be kept at that temperature until it is moderately sour. It should then be cooled promptly to churning temperature (see p. 9) or below and held at that temperature for at least 2 hours. It will then be ready to be churned.

The souring of milk and cream is caused by the growth of bacteria, which are a simple form of plant life. Bacteria are always present to some extent in milk and cream. Certain types of bacteria are desirable. Some of them produce lactic acid, which gives milk or cream its sour taste, and some produce the pleasing flavor and aroma so characteristic of good, ripened-cream butter. Other types of bacteria produce objectionable flavors and odors. Great numbers of these undesirable types may be in the cream as a result of uncleanness in the production or handling of the milk or cream.

At the ripening temperature the undesirable bacteria as well as the desirable ones grow, and therefore bad as well as good flavors are produced. If the undesirable bacteria predominate the objectionable flavors will predominate. Even in cream produced under the best conditions some undesirable bacteria are present. At the proper ripening temperature (70° to 75° F.) the desirable bacteria are able to suppress the growth of the undesirable bacteria, but if the temperature

of the cream is above 80° the growth of certain undesirable types is stimulated and a fermented or cheesy flavor may be produced. On the other hand, too low a ripening temperature will permit the production of stale or bitter flavors. Even at the proper temperature, too long a ripening period produces a high acidity in the cream and results in the butter having a sour flavor and a poor keeping quality.

It is, therefore, evident that high-quality, ripened-cream butter can be made only when the ripening of the cream is carefully controlled. The improper ripening of the cream is one of the main causes of off-flavors and poor keeping quality in farm-made butter. For this reason it is often better to omit the ripening and churn the cream when it is sweet.

SWEET-CREAM BUTTER FROM RAW CREAM

When butter is to be made from raw sweet cream obtained directly from the separator, the preparation of the cream consists merely in cooling the freshly separated cream to churning temperature or lower and holding it at that temperature for 2 hours or more. If several small lots of cream are to be accumulated to make a churning, each lot should be cooled quickly and kept as cold as possible until churning time. Then, if necessary, it should be warmed to churning temperature. Cream accumulated in this way should be churned as soon as there is enough for a small churning, since low temperatures merely retard and do not prevent deterioration. Cream held more than 3 days may still be sweet, but it is likely to have a stale flavor that will be carried into the butter.

SWEET-CREAM BUTTER FROM PASTEURIZED CREAM

Butter that is to be held for several weeks or months before it is used will be satisfactory only if it keeps well. Butter will have the best keeping quality if it is made from pasteurized sweet cream. So the main step in the preparation of cream for this type of butter is the pasteurization of the cream. This is a simple process. It consists merely in heating the cream to a temperature of 165° to 170° F., holding it at that temperature for 15 minutes, and then cooling it. If the temperature goes higher than this no harm will be done other than to cause a slight cooked flavor, which may be noticeable in the fresh butter but which will usually disappear in a short time.

A small quantity of cream can be pasteurized conveniently in a double boiler—a utensil found in nearly every kitchen. For a large quantity, a double boiler may be simulated by placing the can or vessel of cream in a larger vessel partly filled with water. The cream should be stirred frequently while being heated to pasteurizing temperature. When the cream reaches a temperature of 165° to 170° F., the vessel or double boiler may be removed from the heat and kept at the back of the stove for 15 minutes. During this time the lid should be kept on the container to aid in maintaining the temperature of the cream and to retard "skin" formation. The container of cream should then be set in cold water, the cream being stirred frequently to cool it quickly to churning temperature or lower. Since the cream has been heated to such a high temperature, it is best to cool it to 50° or lower and

hold it for at least 3 hours before churning. Holding it cold overnight is sometimes more convenient and this will aid in producing firm-bodied butter.



FIGURE 3.—Pasteurizing the cream is a simple process.

BUTTERMILK FROM SWEET CREAM MAY BE SOURED

Buttermilk from sweet cream lacks the acid flavor commonly associated with buttermilk. It will become sour, however, when permitted to stand at room temperature for 12 hours or more. Vigorous stirring will break it up and produce a smooth-bodied buttermilk similar to that obtained when sour cream is churned.

Buttermilk from pasteurized sweet cream may be soured more quickly by mixing with it some clean-flavored sour milk or buttermilk at the rate of a half pint to a gallon.

CHURNING THE CREAM AND COMPLETING THE BUTTER MAKING

CHURNING TEMPERATURE

When cream is at a temperature of 100° F. or higher the globules of butterfat are in a liquid condition. As the cream is cooled, the butterfat solidifies very slowly. It does not begin to solidify until the temperature is below 75°, and even at 50° solidification is not sufficient for proper churning conditions until the cream has stood at that temperature for at least 2 hours. When the butterfat is in a liquid condition, it cannot be churned into butter. When cream is cooled from 100° to 50° and churned at once, there is no distinct separation of



FIGURE 4.—Holding the cream at or below churning temperature for at least 2 hours before churning is one of the important rules of butter making.

butter granules. Instead, a soft, greasy mass partially separates and, on standing, floats on top of the creamy-looking buttermilk. Only part—perhaps two-thirds—of the fat has churned out, and the buttermilk may contain as much as 10 percent fat.

Further churning will not improve the separation but may re-emulsify the materials so that no butter will be obtained.

Holding the cream at or below the churning temperature for at least 2 hours before churning is one of the important rules of butter making. Holding it cold for longer than 2 hours is even better. In hot weather it is good practice to place the cream in a refrigerator overnight, then, if it is below churning temperature, warm it very slowly, preferably by letting it stand at room temperature and stirring it occasionally.

The proper churning temperature is that at which the butter will form in granules that are firm but not hard. At this temperature the churning period is usually 30 to 40 minutes. This temperature cannot be expressed definitely in degrees on a thermometer because it varies with the season of the year, the feed of the cow, the stage of her lactation period, and other factors.

When the feed consists mainly of succulent pasture grasses, the proper churning temperature is usually between 52° and 58° F. When cows are receiving only dry feed the proper churning temperature is usually between 56° and 62°, but it may be as high as 66° under certain conditions, such as when the ration contains a large percentage of cottonseed meal or other feeds that cause the butterfat to be very hard.

When a cow is far advanced in her period of lactation, her cream does not churn as readily as it does when she is fresh; a higher churning temperature is therefore necessary.

Consideration must also be given to the temperature of the room in which the churning is done and to the kind of churn and quantity of cream. For example, if 1 quart of cream at 54° F. is churned in an open bowl in a room where the temperature is 80° the cream may warm up as much as 10° during churning. But if 5 gallons of cream at 54° is churned in a wooden-barrel churn in the same room it would probably warm up only 2° to 4° in the same time.

In the spring, after cows have been turned out on pasture, if the cream is churned at the same temperature that was used during the winter when the cows were on dry feed, the butter will form in a shorter time and will be too soft. If for any reason, the butter obtained at any churning is too soft, the next churning should be made at a temperature a few degrees lower.

The churning temperature may be maintained at the proper point throughout the year by raising or lowering it to meet changes in conditions.

Too high a churning temperature produces butter with a soft, greasy body and, because the buttermilk cannot be washed out properly, it does not keep well.

Too low a churning temperature prolongs the churning period unnecessarily and is likely to produce butter with a brittle, tallowy body.

HAVE THE CHURN ONLY PARTLY FULL

The churn should be filled only from one-third to one-half full because the violent agitation in the churn incorporates air into the cream and causes the volume to increase—like whipped cream. If a concussion-type churn, such as the barrel churn, is too full, concussion is reduced and the churning period is prolonged.

ADDING BUTTER COLOR

The bright-yellow color natural to butter when cows are on pasture may be obtained when cows are on dry feed by adding commercial butter color to the cream. A uniform color throughout the year may be obtained by adding just a few drops of color per gallon of cream in the fall as soon as the natural color becomes too light and increasing this from time to time as may be necessary. The butter color should be added to the cream after it has been put in the churn.

THE CHURNING PROCESS

In different types of churns—for example, the dasher churn, the barrel churn, and the egg-beater type of churn—different mechanical means are used to apply the same fundamental principle, that is, to pound, dash, or beat the cream until the minute globules of butterfat are made to stick together to form butter granules.

The first few minutes of churning starts the production of foam, and the volume of the cream increases. After about 20 minutes the foam starts to subside. A few minutes later the entire mass of cream becomes thick and finely granular, like yellow corn meal mush, with



FIGURE 5.—The churn should be no more than half full to allow for expansion of the cream.

buttermilk separating slightly from the tiny granules. When this point has been reached, the churning should be continued cautiously to avoid overchurning. When the butter granules are the size of kernels of corn the churning should be stopped. To continue churning until the butter is in large masses is bad practice because the buttermilk can be washed out only when the butter is in small granules.

WASHING OUT THE BUTTERMILK

After the buttermilk has been drained off, the butter, still in the granular form, should be washed twice with about as much water as there was buttermilk. The temperature of the wash water should be that which will cause the butter to be of the right degree of firmness for

proper working. If the butter is of the proper firmness when the buttermilk is drained off, the temperature of the wash water should be the same as that of the buttermilk, or a few degrees colder if the room temperature is above 70° F. When the butter is too soft, as is often the case, cold wash water should be used—possibly as cold as 50°, and the water should be kept on the butter for about 10 minutes. In exceptional cases, such as churning in a cold room, it may be necessary to have the water slightly warmer than the buttermilk.



FIGURE 6.—When butter granules are the size of kernels of corn, stop the churn and pour off the buttermilk.

If the butter should form into large chunks before it is washed, these should be cut up with a butter paddle while in the wash water to aid in the removal of buttermilk.

SALTING AND WORKING THE BUTTER

After the wash water has been drained off as completely as possible, the butter should be spread out in the churn, or in a bowl, or on a butter worker, and salt should be added at the rate of 1 scant tablespoonful for each pound of butter, or to suit the taste. The butter is then worked in order to mix the salt through it and give it a close-grained, waxy body. A good way to do this is to use a wooden butter paddle that has been standing in cold water, fold the butter over on itself, then press it out flat, fold over again and press, repeating this until the salt is all dissolved.



FIGURE 7.—Wash the butter twice with about as much water as there was buttermilk.



FIGURE 8.—Work the butter to mix the salt evenly and give the butter a close-grained, waxy body.

If the salt is not evenly distributed throughout the butter, light and dark streaks or spots will appear. The streaks or spots that contain more salt appear darker in color. If, however, the butter is over-

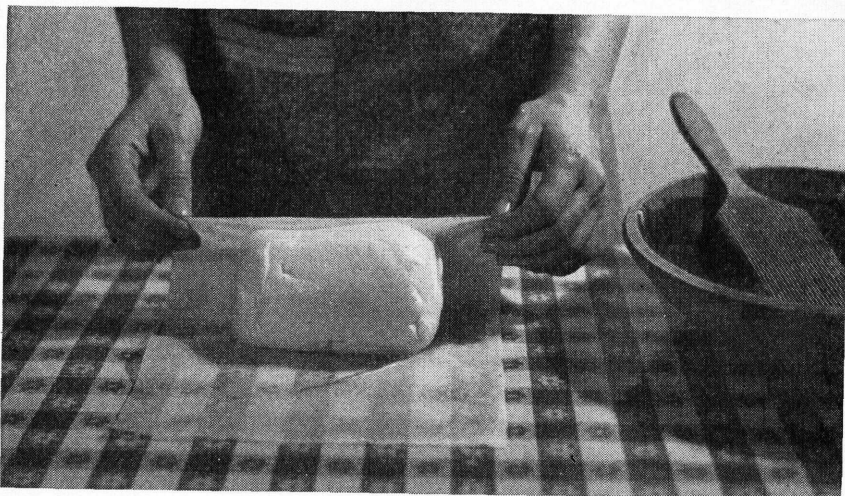


FIGURE 9.—Wrap prints or rolls in parchment butter paper to protect them from the air during storage.

worked or worked when too soft, it becomes sticky and salvy and has a dull, greasy appearance. Properly worked butter has a waxy body and bright appearance. Butter that is very firm requires more working than butter that is only moderately firm.

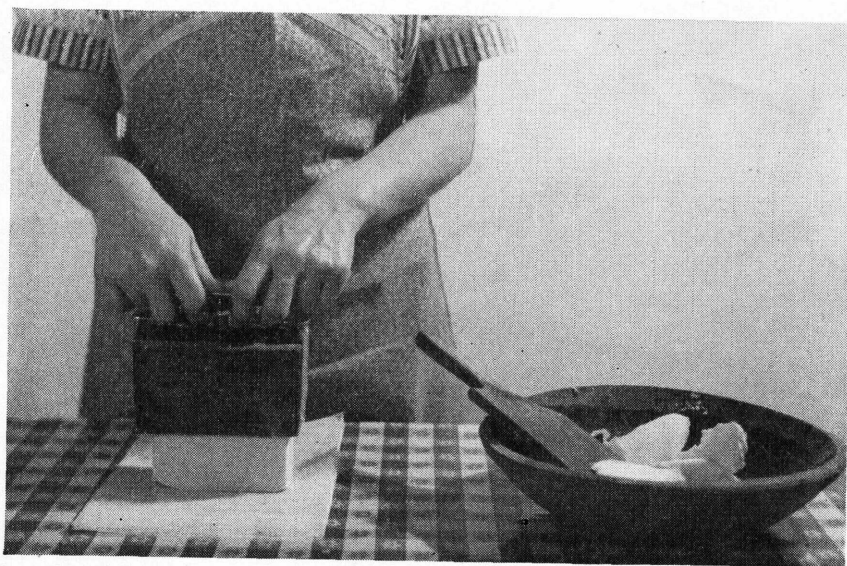


FIGURE 10.—Rectangular blocks or prints save storage space.

While the butter is still in a plastic condition it may readily be formed into rolls or prints or packed in crocks or other containers as may suit the convenience or whim of the butter maker.

STORING OR "PUTTING DOWN" BUTTER FOR FUTURE USE

Butter that is to be kept for several weeks before it is used should be made from unripened, pasteurized sweet cream. The improvement in the keeping quality of the butter is well worth the extra labor of pasteurizing the cream.

The best place to store butter is in a refrigerator where the temperature is constantly below 10° F., or, better still, below zero. Com-

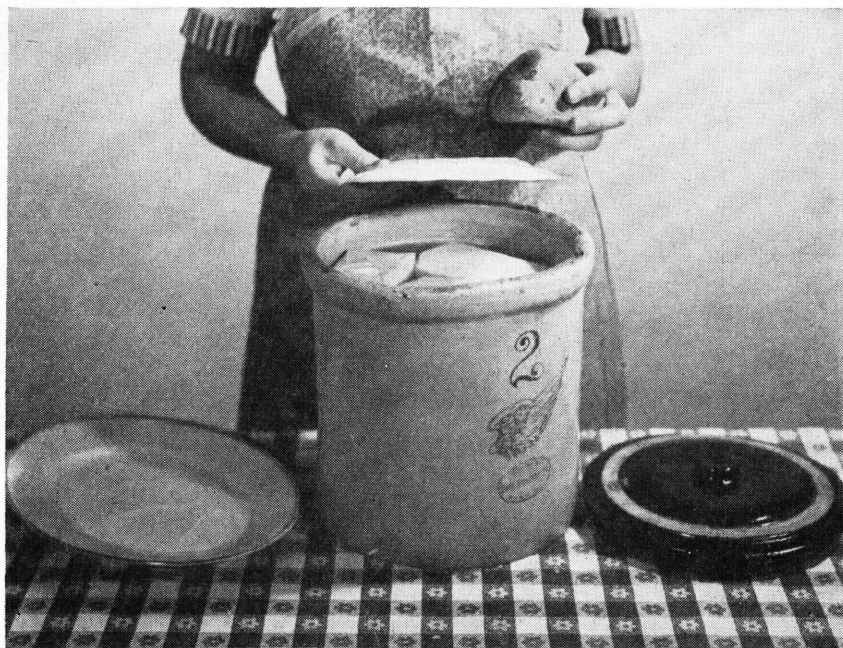


FIGURE 11.—Keeping butter submerged in brine is the most satisfactory way to preserve it without refrigeration.

munity cold storage lockers usually provide the needed low temperature and are therefore excellent places to store butter. To use storage space economically, the butter should be made in rectangular blocks or prints that may be packed closely, leaving no space between them. Each block or print should be wrapped in parchment butter paper to protect the surface of the butter from the air. Sweet-cream butter stored at 0° for 6 months usually shows no appreciable deterioration.

Where a community locker or other low-temperature storage is not available, it is still possible to "put down" butter successfully—provided the butter is properly made from pasteurized sweet cream. Keeping butter submerged in brine has been found the most satisfactory way to preserve it without refrigeration. To store butter this way it may be made into rolls of any convenient size, wrapped in

parchment paper, packed in a large stone crock, and then covered with brine. If the rolls are not packed tightly in the crock, some of them may float and expose a portion of the butter to the air. In this case a weight should be used to keep the butter entirely submerged.

The brine should be made of 1 part salt to 3 parts water, or all the salt that will dissolve. It is better to use too much salt than not enough.

Sweet-cream butter has been stored in brine in a temperature range of 56° to 76° F. as long as 6 months without becoming "strong" or rancid. It did, however, develop a stale flavor and was considered only a fair grade of table butter.

The crock of butter should be put away in the coolest place available but where the butter will not absorb odors from other materials such as fruits and vegetables. If kept in a cellar during the summer, it should be moved in the fall to some place such as a shed on the north side of the house where the temperature is lower than that in the cellar.